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A VISIT TO THE AVEZZANO EARTHQUAKE ZONE

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ON January 13, about 8 a. m. a sharp earthquake was felt throughout central Italy. Rome itself was shaken. A statue fell in St. John's Lateral, new cracks appeared in the column of Marcus Aurelius and minor signs of strain appeared in other places; but little real damage was done in the city and no one was hurt there. One gentleman, indeed, who happened to be shaving when the shock occurred, assured the writer that he had a narrow escape from cutting himself; but he likewise remarked sarcastically that he had no idea how severe the shock had been in Rome until several weeks later, when he received the New York papers. The first reports from the country districts also indicated more alarm than real damage, but late that night it became known that several towns located 75 to 100 miles east and northeast of Rome had been almost completely destroyed.

At first the government was indignant that the responsible local officials had not promptly reported the facts, and it is whispered in Rome that a decree was even prepared removing one of the mayors from office for such neglect of duty. As it happened, however, it proved impracticable to serve notice of removal, for the reason that the mayor in question, together with most of his fellow townsmen, was dead. As soon as the magnitude of the disaster dawned on the public, troops and physicians were hurried to the stricken district. Owing to the complicated international situation, the government announced that foreign contributions would not be accepted, but funds were promptly subscribed in Italy and various relief agencies set in motion.

On February 11 the writer reached Rome and on February 15 went with a party of four, by motor car, to Avezzano, located some 70 miles by road east of Rome. The road (substantially the ancient Via Valeria) follows the valley of the Aniene through Tivoli and up the western slope of the Appennines, descending eastward into an extensive basin without natural outlet. This basin formed the stronghold of the ancient Marsi, who gave the Romans such a severe tussle and later furnished the best recruits for the Roman legions. It is interesting to note that the population of that district still impresses one as distinctly superior in a physical way to the people on the low plains. Crossing the Roman campagna, there were several heavy dashes of rain which helped to make the road all but impassable. In fact, two tires exploded during the run out, which delayed the party so much as to spoil the original plan of making the round trip in one day.

Around Tivoli, olive harvest was in full swing, the people singing gaily as they worked. The snow line was, however, reached at no great distance

*Professor Robinson is spending the present academic year in Europe.—*Editor.*

above Tivoli, and over the higher mountains the snow was piled three to four feet deep beside the road. This snow mantle made it impossible to verify the reports of those who had gone over the road soon after January 13, to the effect that much of the roadbed between Tagliacozzo and Cappelle, on the eastern slope, had sunk some 5 or 6 inches, and that at one place a transverse crevice nearly three feet thick had appeared. The latter crevice, if it ever existed, had of course been filled long before this date.

On the way, a sharp watch was kept for earthquake damage, but none was seen until well across the divide and in fact within a few miles of where the greatest loss of life occurred. Notwithstanding the fact that the shock was felt over an unusually wide area, the zone of destruction was thus relatively restricted. The first clear evidence of the earthquake was a shattered farm building on the hills not far from Cappelle, which also lay mostly in ruins. When we reached Avezzano, the streets were filled so high with wreckage, that the car had to be abandoned and further explorations made on foot.

The Terrible Destruction

In this town of some 16,500 inhabitants, only one building over one story survived, and that was of reinforced concrete. A number of the one story structures survived, but in some cases even where the outside walls appeared intact, the interior had been wrecked by debris from the roof and the inner side of the walls. The completeness of the collapse was due in part to the force and duration of the shock (over a minute), and possibly in part to a compound motion, which seems to be indicated by the fact that the four corner posts of some buildings had all fallen outwards. For the most part, however, the heavy mortality was caused by the construction of the houses. Italy lacks coal, which renders structural iron expensive; and the mountains having been long ago deforested, lumber is likewise a luxury, as everywhere in the Mediterranean region. As a rule, therefore, the houses were built of loose stones of various sizes and shapes, without even timber to stiffen the walls; and most of them lacked effective mortar to hold the stones together. As a result, the walls simply crumbled into shapeless mounds of stone and sand, burying nearly the entire population beneath them. At Avezzano, out of the entire population, 96 per cent are estimated to have perished; and some other places were almost as severely visited.

Owing to the nature of the ruins, the great majority were killed instantaneously. In some cases, indeed survivors were released after several days; and one man, imprisoned in a barn where he could reach water and grain, was taken out alive after 25 days, though (it is said) in so emaciated a condition that his sister failed to recognize him. While our party was there, three persons (an entire family) were laid out in plain pine boxes. For some reason, however, the work of excavation seemed to go on in an unsystematic and half hearted way. There is no place near at hand where the debris can be dumped and the mass of it is too enormous to haul far. Already, in one case, a new village site has been chosen, some 200 or 300 metres away from the

old one; and the ruined houses may quite possibly remain the tombs of many of the victims, as happened after the last great shock at Messina.

On the other hand, every effort is made to provide for the living. Everything has to be brought from a distance—tents, lumber for temporary houses, medical supplies and food. Even water comes by rail, all the wells being poisoned by the dead buried in the ruins. To add to the difficulty of the situation, wolves, driven from the mountains by deep snow, and perhaps also attracted, have followed relief parties going into the hills and have even penetrated into Avezzano itself; three have been killed recently in the central park, where the relief work is now organized. Public kitchens have been opened there which provide a wholesome ration. Schools have also been established in rough shacks at Avezzano which have some 50 or 60 orphans each, collected from the damaged villages. These are under the patronage of the queen. In all relief work, the soldiers have taken a leading part, fairly fathering and mothering the dazed and often helpless survivors, young and old alike.

After inspecting these and other relief institutions and photographing some of the ruins, our party found the hour too late for the return trip over steep and winding curves, with a precipice at one side. It was therefore necessary to pass the night at a town (Tagliacozzo) just outside the zone of destruction. By morning some 6 inches of fresh snow had fallen on the mountains, and the car finally stuck fast on a narrow road at the foot of a heavy grade. For a time the situation seemed a bit unpleasant, especially in view of the wolf stories which we had heard the night before. Eventually the car was turned and run back to Tagliacozzo, the party returning to Rome by train.

Possible Causes

The question remains, what caused the earthquake? Everywhere in Italy this has been the chief topic of conversation, forcing even the war into a secondary place. The most popular explanation has been that the draining of Lake Fucino (the Lacus Fucinus which bulks large on ancient maps) has so far changed the stresses in the crust as to cause internal fractures. In order to judge as to the value of this explanation, it may be well to glance briefly at the nature and history of the district in question.*

From geological evidence it appears that even in Roman days, Lake Fucino was a mere shrunken remnant of a lake measuring several hundred square miles which at an earlier period covered also the high plains of Alba and Palentini, until finally the water level fell below the hill of Cesolino, an extension of Mt. Salviano. Being fed by torrents flowing down the inner slopes, the water level was subject to great fluctuations. Thus, it is recorded that the surface rose 9 meters from 1783 to 1816, fell 12 meters from 1820 to 1835, then began to rise again. During periods of falling waters, the lake was surrounded by a zone of marsh, and when the waters rose again, great distress inevitably resulted. For this reason the idea of draining the lake

*Rossi G., *Studi e Ricerche sull'Ex-Lago Fucino* (Portici 1912); also folios 28 and 29 of the *Carta d'Italia* issued by the Touring Club.

originally conceived by Julius Caesar as a part of his plan for making Rome less dependent on Egypt for grain, was taken up again by Claudius who employed some 30,000 men for 11 years (61-52 A. D.) driving a tunnel over 5 kilometres in length under Mt. Salviano into the upper valley of the Liri. This tunnel, later repaired by Trajan and Hadrian, for a time prevented fluctuations of level; but it was not low enough entirely to drain the lake and it finally became choked up. More than a thousand years later, Frederick II. gave orders for clearing out the Claudian tunnel, but it remained for the Bourbon government of Naples seriously to undertake this work (1826-1835). The complete drainage of the lake, first attempted in 1845-48, was finally accomplished under the direction of Prince Alessandro Torlonia (1852-76), by the construction of a new low-level tunnel into the Liri, with an extensive system of collecting canals. The area drained when the reduced lake disappeared amounted to 15,775 hectares, and the cost was something over 3,000 francs per hectare. Incidentally it may be noted that most of the reclaimed land remained the property of the Torlonia family, whose head still represents that district in the Italian parliament. The Torlonia mansion at Avezzano was among those destroyed in the earthquake, burying some 30 persons in the ruins. This recital of facts seems to dispose of the idea that the drainage of the lake caused the earthquake since the area finally cleared of water was too small seriously to affect the crustal stresses; and the work was moreover completed nearly 40 years ago.

Another popular explanation is based on the assumption (1) that the depression formerly occupied by Lake Fucino is the crater of an extinct volcano like the lakes in the Alban hills and elsewhere near Rome; and (2) that the earthquake was due to volcanic forces, long quiescent but not yet extinct. Color is supposed to be given to this idea by the fact that a severe shock occurred in the same general district in 1214, and another in 1885. However, repeated shocks may be due to faulting quite as readily as to volcanic action; and the western Apennines, unlike the mountains northwest and southeast of Rome. The presumption is therefore against vulcanism as the cause, although the snow made it impossible to determine by inspection whether the district offers any evidence of volcanic action.

Scientific writers, on the other hand, have been cautious in assigning reasons, contenting themselves as a rule with pointing out that the superficial area affected was much greater than in the case of the Messina shock of 1908; that the focus of the latter has been located by Oddone at 9 kolimetres beneath the surface; and that the center of disturbance at Avezzano was probably from 20 to 30 kilometres within the crust. Those speculatively inclined add that there was a center of extremely low atmospheric pressure over Italy; that the moon had just reached (on the 12th) the point in its orbit nearest the earth; and that at the same time the sun showed a particularly violent outbreak of sun spots.

One thing only can be affirmed with certainty: whatever the cause of the earthquake, its effects were especially violent within the area marked by the

highest lake beaches. Nothing is more striking than the relative immunity of towns built on the hills compared to the ruin which befell those built on the plains. Thus Tagliacozzo, on the slope of a mountain where some observers have located the focus of the shock, suffered practically no damage; while Avezzano, located near by on a part of the plain deserted by the lake before historic times, was almost wiped out of existence. Nearly all the towns which suffered severely likewise rested on lacustrine sands and clays, while hill villages in plain sight stood practically unharmed. The conclusion seems clear that the result of earthquakes are far more disastrous on soft and unconsolidated ground.

THE ITALIAN EARTHQUAKE AREA

THROUGHOUT historic times Italy has been visited again and again by earthquakes of the most destructive kind. These disturbances have occurred now in one part of the country, now in another. Scarcely a single locality is entirely free from them, though some parts have suffered much less than others. Among the areas most frequently shaken are the "toe" of Italy, Calabria, and the entire Apennine range.

The center of the disturbance, round the basin of the former Lake Fucino, together with practically the entire region from which severe damage has been reported, is included within an area, roughly forty miles long by twenty miles wide. A few towns outside this area are mentioned as having been damaged more or less, but evidently no more than should be expected from their proximity to the seat of the disturbance.

The earthquake district lies in the very heart of the Apennine Mountains, fifty miles due east of Rome. For the most part it is exceedingly rough. The mountains rise to elevations of 6000 to 8000 feet, while the valley bottoms lie at about 2100 feet. The slopes are very steep and rocky and, in most places, the valleys are deep and narrow.

A notable exception to this condition is found in the neighborhood of the basin of Lake Fucino, where the topographic features are so abnormal that they arrest the attention at once. A glance at the map will show that the lake lay in the center of a nearly level plain, roughly twelve miles long by eight miles wide, set down as it were, into the midst of one of the most rugged parts of the Apennines.

The rectilinear outlines of this sunken area, cutting as they do across the trend of the mountains, seem to indicate clearly that at some earlier time a block of the mountains has dropped down to form the basin of the lake. Other evidences, too, such as the very presence of so large an undrained depression as the old lake basin, and the occurrence of similar though smaller marshy lowlands to the northwest and west, go to show that comparatively recent movements of the earth's crust have taken place in the vicinity and have interfered seriously with drainage.—From "The Setting of the Recent Italian Earthquake," by John L. Rich, in the *American Review of Reviews* for March.

AN IMPORTANT MOVEMENT IN GEOGRAPHY

By the Editor

LAST July a small group of geographers attended the science section of the National Education Association at St. Paul. The need of a national organization of geography teachers was informally discussed and it was decided to test the sentiment of the country through an open letter in the Journal of Geography and through personal letters to a large number of leaders of geographical thought. Professor George J. Miller of the Mankato, Minnesota, Normal School accepted the task of setting the wheels in motion. The large number of enthusiastic replies which Mr. Miller received to the letter which he sent out seemed to indicate unmistakably that the geographers of the country favored the formation of a national association of geography teachers. The plan received a further and most valuable impetus from the cordial support given it by the Association of American Geographers at their annual meeting in Chicago in December, 1914. Shortly after this meeting Mr. Miller sent out the following letter:

THE NATIONAL COUNCIL OF GEOGRAPHY TEACHERS

"As a result of discussion at the St. Paul meeting of the National Education Association in July, 1914, and of extensive correspondence, the undersigned propose the formation of a National Council of Geography Teachers for the purpose of increasing the interest in geographic education and of promoting better geography-teaching.

It is proposed that representatives from each state form the National Council of Geography Teachers, within which there shall be an executive committee; that the representatives from each state be expected to form a state council, composed of the leaders of geography in their respective states. The chief purpose of the state council shall be to promote better geography-teaching in every way possible, working through existing teachers' associations—state, district, county, etc. It is not expected that the teachers of geography in a single state will necessarily hold separate meetings, but it is intended that they shall meet in connection with existing organizations, and have programs devoted to geography. Other purposes are to get speakers on geography for the programs of all teachers' associations thereby directing attention to it and awakening interest in the subject; to assist school officials in organizing geography in the elementary and high schools in accord with the modern conception of the science; to encourage the preparation of papers on geography-teaching for local and national educational journals. Experience will suggest many other ways of advancing the work.

The inauguration of such a movement was heartily approved by the Association of American Geographers at their meeting in Chicago in December, and an advisory committee was appointed to assist in starting the organization. This committee met with those present who had taken the leading parts in the initial steps and organized as indicated below.

The Chairman of the Committee will appreciate your suggestions on the following points: (1) the possibility of establishing a state council in your state; (2) the persons who should cooperate in this movement in your state; (3) methods of increasing an interest in geography-teaching in your state; (4) methods of financing the small but necessary expense of correspondence; (5) any other pertinent suggestions.

The inaugurating committee discussed various methods of organization and deemed it inadvisable to attempt, at present, the holding of national meetings. It is hoped that at opportune times this will be possible in connection with such organizations as the National Education Association, The Association of American Geographers, and the American Association for the Advancement of Science. It is believed that such an organization as proposed will promote the ends desired in an efficient way.

An early reply will be appreciated.

Geo. J. Miller, State Normal School, Mankato, Minn., Chairman.
L. O. Packard, Normal School, Boston, Mass., Secretary.
Charles C. Colby, Peabody College for Teachers, Nashville, Tenn.
Richard E. Dodge, Teachers College, New York City.
R. H. Whitbeck, University of Wisconsin, Madison, Wis.
Charles R. Dryer, Fort Wayne, Ind.
Inaugurating Committee."

We believe that this movement is fraught with large possibilities. Every school man knows how genuinely school geography needs improvement. Everybody knows that such improvement can come only through the persistent organized effort of many people in many places. The splendid work accomplished by the History Teachers Association is an example of what efficient organized effort can do. History is now one of the major lines of study in every high school; strong courses of study have been worked out, bibliographies have been prepared, a magazine is supported—financially assisted by the American Historical Society—and well-trained teachers are being supplied. The History Teachers Association, like the English Teachers Association and others in their own fields, is both directly and indirectly a powerful factor for the strengthening of history-teaching in the schools. Geography in the high school is not gaining ground at present, partly because it has not the benefit of such an organization. While it would have been better if a national organization of geography teachers had been formed ten years ago, yet, we may feel gratified that it is now making such headway.

A Favorable Time

For a number of reasons the present is a favorable time to initiate the movement for a national organization. The rapid growth of courses in geography in the colleges, particularly in the Middle West, means an increasing supply of qualified teachers. On the popular side, the enormous membership of the National Geographic Society, with its circulation of 400,000 maga-

zines a month, cannot fail to develop a widespread interest in geographical reading. There is no doubt that this is helping school geography by interesting the family in the subject.

On the scientific side, the cooperative work of the American Geographical Society and the Association of American Geographers is full of promise, a promise made all the more encouraging by the addition of Professor Isaiah Bowman to the staff of the American Geographical Society. With three men like Mr. C. C. Adams, Mr. W. L. G. Joerg and Professor Bowman devoting themselves to the American Geographical Society's service, and particularly with the substantial sort of support which is behind them, results of nation-wide significance are inevitable. The generous terms upon which this society invited the co-operation of the Association of American Geographers, and the broad-gauge plans which the society is formulating, give a suggestion of splendid things to follow.

There has been in recent years a notable growth of state and city geographical societies and geographical clubs, Colorado being the latest addition to the group. The geographical lecture courses maintained in Washington by the National Geographic Society are so largely attended that each lecture is given both afternoon and evening, in order to accommodate the people who desire to attend.

These are some of the evidences that the time is favorable for the organization of a National Council of Geography Teachers. It is not desirable to multiply educational gatherings; perhaps they are already too numerous. What seems to be needed is a central National Council, not too large, made up of the leaders of geography in each state. The members of this Council should be men and women who have vision and enthusiasm; men and women who will gather around them the geography teachers of their respective states, and unite them in a whole-hearted, sustained campaign for better school geography. The study may be given a content rich in human worth, but only by a teacher who has gone far enough into the science to see and feel its worth as an instrument of education.

The really effective work of the national organization must be done through state, city, and local organizations. The effectiveness of its efforts will depend upon getting state councilmen who will find in their states persons to take definite responsibility. The real work of uplifting geography-teaching is of two kinds: First, a certain kind of publicity through the educational press,—an awakening of school men to the fact that an old study is taking on new life and must be reckoned with. This will lead to a demand for teachers who are qualified to put new life into an old and somewhat neglected study. This change will come slowly but it will come.

The second phase of the work lies in improving the facilities for training geography teachers. A very substantial improvement in this line is in progress in the colleges and universities. Professor Dodge's investigation* indicates

*_Teachers College Record_, Mar., 1914, Vol. XV, No. 2, and _Journal of Geography_, April, 1915, Vol. XIII, p. 257.

that the normal schools are still doing too little for geography. The pressure upon these schools from all directions is very severe, but geography is entitled to at least a one-year course in every normal school, and eventually it will get it, if the school principals and superintendents call for properly prepared teachers. They will call for such teachers when public educational sentiment suggests it. The new National organization must awaken this sentiment. There are several educational periodicals in each of the more populous states. Their columns are always open to any worthy movement. The National Council should find men to write geographical articles for these periodicals. The state councils should see that geography is adequately represented on the programs of state and county teachers' associations. Five years of such effort will work a big change in geography-teaching in the progressive schools of the country. Mr. Miller is in correspondence with men in 38 of the states. In 13 states, national councilmen have been selected; in several of these, state organizations have been formed or are being formed. Mr. Miller writes (March 25) that Ohio, Kentucky, and part of California and Pennsylvania will organize in April.

The Journal of Geography is glad to place itself at the service of the new organization and to offer its hearty co-operation.

EXCURSION TO ALASKA

PROFESSOR Lawrence Martin is planning to conduct a party for summer field work in Alaska, stopping on the way at the Grand Canyon of the Colorado, the fault lines near San Francisco, and the California exposition. The trip is open to students from other universities and to teachers of geography and geology. It will start the middle of June or first of July for about 2 months. Most of the time will be spent in camp along the fiords and in studying the glaciers of southeastern Alaska, including the Muir, Grand Pacific, Johns Hopkins, and other ice tongues in Glacier Bay near the base of Mt. Fairweather (15,000 feet high), and the Taku, Norris, Eagle, Herbert, Mendenhall, Davidson, Denver, Sawyer, Dawes, Baird, Patterson, LeConte, and the Great Glacier of the Stikine. Examination of faults and other structures in the sedimentary rocks at the border of the coast range batholith, especially in relation to the origin of the fiords. Visits to gold mines, copper mines, marble quarries, gypsum mines, salmon canneries, native villages with totem poles, etc. Possible ascent of Mt. Edgecumbe, a dormant volcano near Sitka. Trip over Canadian Coast Range on White Pass & Yukon Railway. Students without previous training may work for credit in elementary geology and physical geography, while advanced students can take up special problems in physiography, structural geology, stratigraphy, and glacial phenomena. Party limited to 10 men. Total cost probably $500 to $600. For further information address Prof. Lawrence Martin, University of Wisconsin, Madison, Wis.

THE EARTH PRODUCTS OF KANSAS

By W. J. Sutherland
Normal School, Platteville, Wis.

ONE has only to travel over the "Sun Flower" state to become convinced of the importance of her natural resources. Her soils are rich and her fields of corn and alfalfa, her great cattle ranches and her "fields of wheat so full and fair" give evidence of prosperity and plenty. The following sketch, however, will deal with those resources that are hidden from one's eye as he crosses the state on any one of the great railroads that climb the gentle slopes of the Great Plains. It has to do with the coal, the lead and zinc, the oil, the gas, the salt, the gypsum, the building stones, and valuable clays which are not apparent to the eye and yet are of great value and add to the wealth and importance of the state.

Coal

The coal fields of Kansas are in the eastern part and cover about 15,000 square miles. The mines that are now being worked are in the southeastern part of the state, in Labette, Cherokee, Crawford, and Bourbon counties. This region produces two-thirds of all the coal mined in the state at the present time.

The Cherokee shales contain the largest coal beds in Kansas. It is well known that coal is of vegetable origin. During the coal-forming periods vegetation grew in great abundance and attained gigantic proportions. A subsidence of the earth's crust permitted the sea to encroach upon the land; swamp vegetation flourished; giant lepidodendrids and sigillarids fell in tangled masses and were covered by the muds and sands; there they formed beds of peat which later turned into coal. Again the land was lifted, the waters receded, vegetation appeared, and the whole phenomenon of coal formation was repeated. So it often happens that numbers of coal beds are found varying greatly in thickness and in depth.

Oil and Gas

Oil and gas are very important natural resources of Kansas. There are several theories relating to their origin, the one most tenable at present being the organic theory. This theory holds that these substances are products of partial decomposition or destructive distillation of organic matter under water or impervious rocks, and hence away from the oxygen of the air. A familiar example of such a phenomenon is the formation of marsh gas in swamps. Life was abundant in the ancient inland sea, and marine remains formed an ooze on the sea-floor, and this ooze in time hardened into rock. If the resulting rocks were later covered with an impervious stratum, the organic remains would, by the process of distillation, be converted into oil and gas.

It often happens that lateral pressure on the earth's crust causes the strata to warp or bend in gentle folds. This condition of porous strata containing marine remains, capped by an impervious layer, is highly favorable to the accumulation of oil and gas.

Porous limestone or sandstone strata contain water, oil, and gas. Water, being heavier than oil, will collect in the downward folds or synclines. The gas will rise to the highest level and occupy the upward folds or anticlines. Between the water and gas, in the strata that dip away from the axis of the anticline, will be found the oil.

The Midcontinental oil and gas field is one of the most productive in the United States. This field lies in Kansas and Oklahoma. At the height of production in 1905 Kansas produced 12,000,000 barrels of crude oil, besides furnishing natural gas by means of pipe lines to 125 cities and towns, including Kansas City, Atchison, Leavenworth, Lawrence, and Topeka. Practically all of this oil and gas comes from the Lower Carboniferous strata of Allen, Wilson, Neosho, Montgomery, and Chautauqua counties.

Lead and Zinc

The lead and zinc deposits of Kansas are in the extreme southeastern part of the state. They are deposits in the Mississippian strata of the Ozark region. Galena, Kansas, takes its name from lead-sulphide (PbS), as does Galena, Illinois. The Galena region has been one of the rich producers of the Joplin-Galena district. For the past fifteen years the value of its combined output of lead and zinc has varied annually from $1,000,000 to $5,000,000.

The origin and mode of occurrence of these minerals are interesting studies. There is little doubt that they were produced from water-solution. "If there was a small amount of lead and zinc in formations which at one time rested upon the present rocks containing ore, and if these formations were removed by ordinary process of erosion, then the little particles of the sulphide of lead, iron, copper, etc., would become oxidized and rendered soluble and would be carried downward by movements of surface waters, only to be precipitated again in a more concentrated form in the lower-lying crevices and openings."

Gypsum and Salt

Another valuable mineral resource of Kansas is gypsum, commercially important as fertilizer, and as the raw material from which plaster of Paris—cement plaster—is made.

The oldest rock formations of Kansas are of economic importance because they all bear minerals which add much to the value of the natural resources of the state.

1. The Mississippian formations bear deposits of lead and zinc.
2. The Carboniferous formations bear deposits of coal, oil, and gas.
3. The Permian formations bear deposits of gypsum, salt, and clay.

Gypsum is formed by the concentration of ocean water. Time was when a part of the coast of our continent was coincident with the eastern boundary of Kansas. Ripple marks found in the shales and coals give evidence of shallow coastal waters. At the close of the Carboniferous times a long arm of the Gulf of Mexico extended far north into the great plateau region, its eastern shore being approximately the east boundary of Kansas. A steady but slow

uplift of the ocean floor caused the shore-line to migrate westward, driving the ocean waters before it. Simultaneously with this uplift, thick deposits of Permian formation were distributed over the state.

As the water thus receded the westward pockets and basins of the old sea-floor were left filled with ocean water. As these lakes and ponds in time evaporated, the process of concentration occurred and, as a result, beds of gypsum were deposited. This is the rock gypsum. Earth gypsum, found in Dickinson, Salina, Marion, Butler, and Sedgwick counties, is well mixed with silt, clay, etc., and is supposed to be a re-deposition from streams or springs whose waters had been in contact with the soluble gypsum rock.

Gypsum rock is largely distributed in Comanche, Barton, Kiowa, Salina, Dickinson, and Marshall counties. It is also found in Marion, Harvey, Sedgwick, and Sumner counties.

Cement plaster is manufactured at Blue Rapids, Dillon, Rhodes, Longford, and Medicine Lodge. The chief step in its manufacture is the process of heating the gypsum rock to drive out the water.

Salt, like gypsum, is a deposition of saline waters. In the production of salt, Kansas is the fourth state, being surpassed only by New York, Michigan, and Ohio. In 1910 Kansas produced 2,800,000 barrels of salt. Hutchinson, Lyons, Kanopolis, and Kingman are engaged in salt manufacture.

Building Stone and Clay

Limestone and sandstone are of commercial importance as building material. Kansas is generously supplied with rock deposits of excellent quality. The commercial value of rock depends, among other qualities, upon—

1. The ease with which it can be quarried.
2. Its color and texture.
3. Its durability.

Building stone of excellent quality is found in many parts of the state. Geary, Riley, Cowley, and Chase counties have fine quarries.

Valuable clays are found in many parts of the state. There are different varieties and the supplies are practically inexhaustible.

Pure clay is a compound of aluminum, silicon, and oxygen combined chemically with water. Such clay is called kaolin. The term "clay" as commonly used applies to any soft earthy substance capable of assuming any desired form and retaining that form during the process of burning. Fire clays are found underneath coal beds. Their position is explained by the fact that the vegetable growth that was converted into coal extracted certain elements from the soil in which it grew, thereby leaving a stratum of under-clay of such physical and chemical properties as to withstand, without melting, the high degrees of heat necessary to burn it.

The clay output is in the form of tile and vitrified brick. Large quantities of these products are shipped from Cherryvale and Coffeyville.

While we are more likely to think of corn, wheat and live stock in connection with the great state of Kansas, it must be apparent from the above statements that the earth products are also of great importance.

DEATH VALLEY

By George D. Hubbard
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DEATH Valley is selected as a type of a structural feature common in the Great Basin in Western United States. It was not made by a stream and perhaps ought not to be called a valley at all. Neither is it in general a death-dealing place, but received its name because of the fatally disastrous results which its lack of drinking water visited upon a lost gold-mining party hastening to the Sierra gulches in 1849. Death Valley has often been said to contain carbonic acid gas and by this means to suffocate its visitors, but the ravine which fills with carbon dioxide is Death Gulch in Yellowstone Park and not this much larger valley in California.

Like a hundred other depressions in the Great Basin, Death Valley owes its origin to two processes: (a) the faulting and displacement of blocks of stratified and igneous rocks, and (b) more or less erosion on the resulting forms. Approximately parallel faults, or cracks with displacement, extend through the basin region from southern California completely into Oregon. Along some of these cracks the vertical movement has been very great. Some blocks of rock have been shoved up, others have been dropped down; some have been tilted and some have been more or less crushed. Thus the characteristic forms of the Great Basin are long, rugged, rocky, serrate ridges or mountain ranges with a steep slope on one side and a gentler one on the other, rising above, and more or less completely shutting in, elongate often curved and crooked, deeply aggraded depressions. Many of these have no exterior drainage. Some would contain lakes and would overflow if the rainfall were slightly increased. Some contain temporary or intermittent lakes which may be either fresh or salt, and when salt, either with common salt or carbonates or borax or with several salts mingled.

Location

Death Valley lies in the eastern part of Inyo County, south western California, bounded on the west side by the Panamint mountain range and beyond the mountain Panamint Valley, and bounded on the east side by the Amargosa range, divided by east and west cols into short sections which are named from north to south Grape Vine, Funeral, and Black Mountains, three short ridges which make up the larger range. The state boundary between Nevada and California lies along the eastern part of this range. Death Valley is from five to twelve miles wide and one hundred and twenty-five miles in length, markedly constricted about one third of the way from the north end. It has no outlet to the sea. This valley happens to be the result of the dropping down of one block with reference to its neighbors, so that the floor of the valley, in spite of the extensive subsequent filling, now lies farther below sea level than any other portion of the United States not covered by water. More than five hun-

dred square miles of the floor lie below sea level and the lowest point is at least two hundred and eighty feet beneath that level.

Description

Following these general lines given in the previous paragraph, many details ornament the valley. In many places because of the broken strata in the walls of the valley spring waters issue, and run down the slope toward the bottom to be soaked up by the sands at the foot. Some of these springs are of fresh, cool, thirst-slaking water; others are salty, with common table salt and borax, and others have even less agreeable substances. Some of the springs are very warm and are said to be boiling. Occasionally a spring has been found to be very injurious to man and has been marked as a "poison" spring. In a number of places, wells have been dug. Not many of these furnish water suitable for drinking, but they may be of value as sources of salt.

The walls of the valley are ribbed by erosion valleys and divide crests, both of which rise rapidly to the tops of the bounding mountains. Down these ravines, when rain falls, the water rushes with great velocity, sweeping stones and gravel and sand out upon the valley floor. Consequently the floor is very well covered with sand and stones, but because the valley has no outlet and the water which runs into it usually contains salt which is left behind upon evaporation of the water, the sand is thoroughly mixed with quantities of salt. A considerable stream leads into the valley at the south end from Amargosa Valley which lies to the east. This water is brackish when it enters, and during rainy weather accumulates on the floor of the valley to a depth sometimes of many feet, forming a temporary lake of thousands of acres. These waters dissolve the salt already on the floor of the valley, mingle them with the salts brought in, and when the water again evaporates, which must necessarily take place in so dry a climate, the salts are again left on the valley floor. Several tracts are covered with a snow-white, glistening mantle of salt, producing extremely smooth salt flats. In other places the salt is less disturbed by the waters and has become broken up by re-crystallization until the salt surface is rough to travel over. Of course, these salt areas occupy the lower portions of the valley and just beyond them, along the valley sides are the mud flats, where the edges of the waters lie when the valley becomes flooded.

In rainy weather these mud flats become muddy and sticky, but in dry weather both sand and mud and salt are blown about more or less by the winds. It is believed that a much larger stream than the Amargosa formerly entered this valley, from the Mohave desert, leaving its waters in the depression to evaporate. Consequently, there may have been a very considerable lake at former stages in the history of Death Valley, but any record of such a lake, either in shore lines or in beds of salt, is completely covered by the later, less organized deposits. Many craggy cliffs overlook the valley from the divides between the little laterals that lead down into Death Valley. These are more or less wind-carved, and grooved, and bear fantastic names appropriate to their forms.

Climate and Vegetation

Shut in by mountains and lying in the lee of the great Sierras which rise 10,000 feet above sea level across the approaching Westerlies, Death Valley can receive but little rain from the west, even in winter when conditions are most favorable. In summer the valley lies in the high pressure belt of calms and in the beginnings of the Trades whose only course has been across as arid lands as the valley itself, hence very little rain can come in summer time. The total rain fall in the valley rarely exceeds five inches in a year and averages less than half that amount. Over the surrounding slopes the precipitation is a little greater, but is nowhere sufficient to promote the growth of much vegetation. Mesquite grows over small areas or in clumps here and there. Grass is very rare. Upon the bordering slopes there is a larger variety of tree growth and some shrubs and scanty grass but much of it dries down during the heat of summer.

The depth of the valley and lack of water for evaporation and consequent cooling give the depression in this latitude a high summer temperature. With the dryness and heat and the winds that often blow strongly here, the sand, dust, and salt greatly harass the traveller.

Culture

One would think that such a place as Death Valley would be rather devoid of culture, but it has been visited considerably by man, and to its peculiar geographic complexities many adjustments have been made. Adjustment is often more necessary in such places than in more favored localities. Wagon roads run the entire length of the valley with stops at some of the springs and wells, where water can be had. An automobile road runs through the Amargosa Valley and sends a branch through a low pass into Death Valley. Branch roads lead off from the main road through the valley, up many of the ravines and gulches to springs and in a few cases to mineral deposits. The wells will probably some day be pumped and the water from them evaporated to recover the potash which is universally associated with the salt in the valley. This potash is an essential plant food and will be used in the manufacture of fertilizers.

At two points in the valley borax works have been constructed and some of this salt is being recovered for commercial purposes. Probably, however, the common salt is by far the most valuable of the mineral resources of the valley; but in as much as there are many other places where salt can be recovered without encountering so great physical hardships, as must be overcome here, the salt of Death Valley may not be extensively used.

The valley can be visited easily at almost any time of year by travelers on the Santa Fe or Union Pacific Railroad by taking the Tonopah and Tide Water Railroad which connects these two main lines and passes through the Amargosa Valley some fifteen miles east of Death Valley. Of course, no such valley as this can ever be of any particular value for agriculture, grazing, forestry, or in fact for permanent settlements of any kind unless there should

come a great climatic change. The region is so low and is nestled down between such elevated mountain chains that it is very warm and also very dry, but it is slowly being filled up by the wash from the sides; and the time can not be far away, physiographically speaking, when Death Valley shall not be below sea level, but perhaps many feet above. As this grading-up process advances, the extreme heat will be reduced and a valley trench leading out may be established, so that the saltiness can be reduced and then possibly some agricultural use can be made of the place.

Its chief interest today centers in the fact that its floor lies farther below sea level than any other ground in America. But aside from this fact, Death Valley can be duplicated by scores of valleys, perhaps equally large and equally interesting, throughout the Great Basin.

FRANCE: ITS NATIONAL DEFENSE*

By Onesime Reclus

Translated by Dr. A. N. Winchell, University of Wisconsin

THE situation of Europe requires that France should be strong, neither attacking nor provoking any country. She has no one to fear. In order to carry out this program, she counts on the valor of her army and navy and on the strength of her frontiers. Secondarily, she counts on her allies and her friendships.

In spite of the variations in sentiment and interests which sometimes unite the powers and sometimes arm them against one another, the national defense need not consider all the possibilities of conflict nor be prepared for defections. At the present time France is supported by the Russian Alliance and the English friendship, and directs her efforts against the strongest and most dangerous power of the Germanic-Italic-Austrian Alliance—the German Empire. Assuming the conflict between the forces of the Triple Alliance and those of the Triple Entente, we should have to contend with not only the German active army of 876,000 men, but the 300,000 men of the active Italian army, and the 400,000 men of the active Austrian army. On our side we could count upon the 1,470,000 of the active army of Russia, but upon those only, because it is not probable that England, if it was brought into the conflict, would consent to divert its army of 425,000 men against Holstein or Hanover or even Flanders (in case Germany should violate the neutrality of Belgium) and create there a diversion. With its fleet it may be able to do more or less; its superiority, still undisputed, over anyone of the European fleets would assure us freedom on the seas.

After 1870, French strategy had at first no other objective than the protection of its territory against a new invasion of Germans, and to accomplish this used only the one method of the construction of lines of forts between

*From an article by Onesime Reclus published in the "*Atlas de la Plus Grande France*," a short time before the present European War.

the northeastern frontier and the French capital, blocking the road to Paris. The adhesion of Italy to the Triple Alliance, the monopoly of Luxemburg by Germany, and the fear of the violation of the neutrality of Belgium and of Switzerland, have forced us to fortify our frontiers from Dunkirk all the way to the Mediterranean Sea. In the meantime military strategy has undergone some evolution. It has conserved the lines of fortification, but, counting more on the movements of the army, it has directed its efforts toward the construction of entrenched camps suitable to furnish strong bases of operations. At the same time it has multiplied railroad lines with vast terminals destined to concentrate rapidly large bodies of troops at points to be protected or attacked. From this conception an army organization results which may be described in general as follows:

The French System of Defenses

In the fortified towns near the frontiers permanent garrisons are established destined to receive or to give the first blows of the war. On the frontier itself fortifications guard the principal railroads. Back of this region, on what one may call the military frontier, entrenched camps are connected by lines of fortifications and separated by intervals where the natural topography limits the field of action of the enemy. Here and there are several series of new entrenched camps. Still farther from the frontier are the great central points of our national defense, Paris and Lyons. Four army corps form the garrison of the northeastern frontier. They are on war footing and can enter upon a campaign a few hours after a declaration of war.

The natural configuration of France apparently determines four possible zones of military operations. 1. Lorraine, Champagne, Burgundy and Breese. 2. Artois, Flanders and Piccardy. 3. The valley of the Rhone and Provence. 4. Guyenne and Gascoygne. Here again the present conditions of foreign politics intervenes. They permit us, in view of our relations with Spain and also in view of the formidable barrier of the Pyrenees Mountains, to neglect this fourth zone and to concentrate our attention on the three others, which are in more or less direct contact with Germany and Italy. The first and the third, those of the northeast and of the southeast, are protected in whole or in part by mountains, rivers, hills and forests, and have received from military engineers additional fortifications at strategic points. The second, to the north, is destitute of natural fortification and must be fortified artificially.

On the northeast frontier, which is protected by the Jura Mountains, the Vosges Mountains, the Meuse River and its tributaries, the Meurthe and the Moselle, and secondarily by the Saone and the Marne, military genius has completed the works of nature by fortifying the exposed points. The Alpine frontier, naturally more easy to defend in spite of the relatively easy crossing of its passes, is fortified at numerous points, and secondarily by the great entrenched camps of Lyons and Toulon. The northern frontier is left open to the enemy by nature. The neutrality of Belgium, which covers it from a point northwest of German Lorraine to the north sea, should be sufficient to

protect it; but, in fact, no one believes that neutrality is a sufficient protection, not even the Belgians, who have multiplied on the Meuse defensive works and have strongly fortified Liege, Namur and Antwerp. All of the forts made by Belgium to repel invasion are so much added to the defense of France. Assuming an invasion which, crossing Belgium would try to penetrate our country, our armies would find it necessary to engage in battle immediately. They would be supported by the fortified points of Dunkirk, Lille, Maubeuge, Charlemont, and secondarily by Fere, Laon and Rheims.

If all the lines of defense of the frontier were broken, Morvan and the central plateau would see the final supreme efforts of national resistance.

If we consider the extreme difficulty of invading France through the Alps or the Jura Mountains, the considerable difficulty of army operations in the Vosges Mountains or in the Ardenne covered by forests and swamps, and if we consider on the other hand the natural battle fields formed by Lorraine and the Palatinate, the fields of the Moselle, the Meuse and the Sarre, or the vast plain of Flanders, we must conclude that the probable theatre of future hostilities is in these latter regions. Here also a neutrality intervenes—that of Luxemburg. But through its railroads the country is already in German control, and military strategists count so little upon the neutrality of Luxemburg that they accord to the adjacent plains of the Woevre the sad and glorious privilege of supporting the first shock of the war.

The Defense of the Northeast Frontier

The French frontier between Longwy and Belfort is divided into three parts which are distinguished by the nature of the country and the strength of the fortifications. The first part between Longwy and Nancy includes the plains of Woevre. The second, extending to Donon, faces the gap of Charmes. The third extends along the Vosges Mountains from Donon to Ballon.

The Woevre, a large plain whose valleys and roads give access to the Meuse and the important railroad which follows its course, is open to invasion. * * * We may readily suppose that the invading army will attack by preference on the plains of Woevre. Furthermore the formidable way in which the German troops are massed on the front near Metz ready for the attack on the plains of Woevre is the principal but not the only point of danger along the northeast frontier. Before 1870, and even after that date, Moltke made of it the invariable plan of a war against France. The former Marshall, military writers, and officers discussed the plan, noted its inadequacy and supported it by a complimentary movement, a flanking movement through the gap of Stenay and a simultaneous more widely flanking movement through Belgium. They showed the advantage of attacking the French forces in front and on the flank at the same time, and also the difficulty of attacking our forces on a front too narrow to enable the Germans to profit by their numerical superiority.

The neutrality of Belgium is of little weight, but will the Germans expose themselves by violating it to a new enemy whose forces are not to be dis-

dained? Will they have recourse to a flanking movement by the gap of Stenay together with the direct attack, or taking lessons from the last wars and recognizing the necessity of renewing an attack with fresh troops and having recourse to troops arranged deeply on Enechelon, will they revert to the plan of Moltke and adopt only the direct attack? That is the secret of tomorrow.

. . . . . .

Reclus goes on to describe the disposition of the various parts of the German army on the three assumptions of (1) A direct attack on the plains of Woevre. (2) A direct attack together with a flanking movement through the gap of Stenay. (3) A direct attack together with an attack through the gap of Stenay and a wide flanking movement through Belgium. Finally he argues that both preparations in Switzerland and railroad construction in Germany make a flanking attack through Switzerland very improbable.

Translator's Note: It is an interesting fact that the Germans in the present war have respected the neutrality of Switzerland, and have violated the neutrality of Belgium, as predicted by Reclus. They have adopted the third one of the modes of attack described by him, because it was the plan which enabled them to make full use of their numerical superiority in men. As suggested by Reclus this violation of Belgian neutrality has resulted also in bringing England into the war, not only with her powerful navy, but also, contrary to his prediction, with a formidable army.

THE PRESENT STATUS OF HIGH SCHOOL PHYSICAL GEOGRAPHY

IN the April *School Science and Mathematics,* Mr. Charles E. Peet of Lewis Institute, Chicago, publishes the first installment of the report of his committee's investigation of Physical Geography. He says:

"The impression has been abroad for some time that high school physiography is on the decline, that it has failed to make good and is either being displaced by other subjects or the course is being shortened to make place for other subjects. Your committee was appointed to ascertain the facts. The first effort of the committee was to learn how many schools have dropped the physiography in the last few years. Correspondence with the State Superintendents of Public Instruction of Iowa, Minnesota, Wisconsin, Michigan, Illinois and Indiana, brought out the fact, that with one exception, there are no statistics in their possession bearing on this point. From the Minnesota superintendent we learn that the number of high schools in that state offering physiography have been practically constant in the last four years. Without taking a census of the high schools by mail, we have seen no way of getting the complete facts. In Iowa, Miss Alison E. Aitchison, a member of this committee, examined the entrance credentials filed by 473 students, representing more than 250 Iowa high schools and found that only 32 did not present physiography as an entrance credit. It is the opinion of one of the geologists of

the University of Iowa that physiography is being replaced by general science, and by agriculture and biology, but that the change is so recent that it does not yet show in the entrance credentials.

As another possible source of information letters were addressed to the principals of 161 high schools, in the states mentioned, which have recently adopted "Clark's General Science" as a textbook.

The committee received replies from forty-eight schools. Thirty-four of these schools offer a course in physical geography, and five in general geography. In nine schools physical geography has been dropped. In its place seven have substituted elementary science; one manual training for boys and physiology for girls; and another elementary science and general geography. In five of the thirty-four schools now giving physical geography the course has been cut to a half year, and elementary science introduced; in four schools physical geography has been moved to a later year by the introduction of elementary science."

One point in the enquiry had to do with the extent to which General Science is displacing Physical Geography and the reasons. Mr. Peet prints a list of six reasons given by different persons, and concludes with the statement: "The facts gathered do not show the marked falling off in the physiography that would be expected considering that the information comes from schools which have recently introduced a subject that is supposed to be displacing it."

Another line of enquiry aimed to discover to how great an extent the impression that "physiography has not made good" is true. The replies from colleges and normal schools indicate that they are not able to build their courses upon the knowledge of physiography supposed to have been gained in the high school. One college professor's reply seems to state the situation well: "The foundation (in physiography) is as good probably as the foundation in any other subject pursued in the high school for the same length of time. For example, half a year of algebra in the first year of high school is not a very sure foundation for mathematics."

To the question: "In your judgment how do the results in physiography compare with those in botany, zoology, physics, and chemistry?" seventeen answer that in physiography they are inferior. Four more say that they are inferior to the results in physics and chemistry, but equal to those in botany and zoology; one says that the results are inferior to those in botany with girls and in physics with boys. Eight answer that the results in physiography are equal to, and four that they are superior to those in the other subjects mentioned. Eight answer that they do not know, or that comparison is impossible. Other answers are: "The results are less definite but no less in value." "The value is greater on account of the greater value of the subject, but ordinary examinations would suggest a contrary conclusion, for physiography is not as well taught as are the other subjects." "The results are as permanent as those in the other subjects."

In reply to the question, "What tangible results do you observe have been

produced by the high school physiography?" eleven answer that no tangible results have been observed. Other answers are as follows:

1. "Most of the high schools in this state give a course in the first year which is intended to be an introduction to scientific methods of observation and reasoning. As the students have no foundation to build on, they do not really gain much, and so do not apply the little they do gain, and it does not stay with them. The course is usually taught by whichever instructor happens to have the least regular work on his schedule, without any regard to his fitness or preparation. Hence the net results are usually small; quite as often as not, they are actually negative. Frequently the student is given a distaste for science in general. A well selected course in general science taught by a specially trained instructor would give much better results.

"There are a few schools where the subject is well taught and good results are secured, but when the pupils are twelve to fourteen years old, as they usually are in the first year of the high school, the instruction given can hardly be called instruction in physiography. A few schools do really good work with their seniors in courses which emphasize and correlate the principles learned in the other science courses and so help to fix them."

2. "On the whole the results have been beneficial, but not commensurate with the time spent because of the teacher's general lack of preparation in geology."

3. "Where the teacher has been a good one, a great deal has been done to make the pupil think about processes going on around him. With a good teacher much interest has been developed and the work is excellent."

4. "High school physiography in so far as it is handled by specially trained teachers has been markedly successful and has supplied new and useful ideas in great numbers and more than any other subject. But the result is not apparent in cases where the music teacher or the teacher of English Literature or any other unqualified person is assigned the work in physiography. The day has passed when 'any old person' can handle physiography."

5. "I have spent considerable time in investigating this problem in Iowa, and I think I can say that a considerable interest in the subject has been developed, and one that is educational. This, I find, varies with the conditions under which it is taught."

6. "As a rule an interest is developed. In individual cases I have found the opposite."

7. "I rarely find a student enthusiastic about the subject; as a rule students are indifferent to it."

8. When high school physiography is well taught we get good results. Well taught students want to go on with the subject. They find it helpful in history, economics, and geology."

9. "General appreciation of earth sciences."

10. "Renders the student better able to cope with general geology and stimulates an interest in natural science."

11. "In the few instances under my observation, a firmer grasp of geographical problems is the result."

12. "Makes better teachers in geography."

13. "The mind has been opened to view large things and to view small things in a large way."

14. "In a few high schools where the teachers have had special preparation for their work, I find that the pupils have acquired a well organized body of facts."

15. "The results stand second to none as a first year high school subject. Give it a full year with an enthusiastic teacher and you put the boys and girls in touch with more valuable notions about the common things of life in broad outlines than is possible in any other subject. Pupils like it. They have their eyes opened to a helpful interpretation of the common things about them. They enjoy their walks, excursions, and travels better. They see and appreciate relationship among wind belts, rainfall, vegetation, and population and industry."

16. "Doubtless there are results, but these are not tangible except in an occasional student. I sometimes think the poor work of students (some of them) having previous preparation may be in part due to an attempt to slide through on what they have retained of the past work, coupled with a spirit of rebellion at having to do this work over again (though they can make little progress unless they do)."

17. "Occasionally a man enters my classes, whose interest has been aroused by his course in physiography, but it usually takes the form of a belief that he has learned all that is to be obtained."

18. "Usually the only tangible thing in evidence is a superficiality and conceit of knowledge. The exceptions are individual."

19. "I am not prepared to speak positively, but it is my opinion that because of the usually poor preparation of high school teachers for teaching physiography, it does more harm than good."

COMMERCIAL RUSSIA

(From Special Consular Report No. 61)

Transportation

RUSSIA'S vast territorial extent and the bulky character of the products entering into its commerce, both foreign and domestic, have made the question of transportation vital. The marshy character of a large part of European Russia, with the lack of available road materials and the sparsely settled condition of much of the country, have made the construction of good roads difficult, and there are something less than 500,000 miles of roadways in the entire Empire. Of the existing roads, more than 300,000 miles are in European Russia proper, and more than 45,000 miles in Russian Poland. During the winter sledges are used throughout the greater part of the coun-

try, and transportation is then easier than over the roads during the open season.

Inland Waterways

Its water transportation facilities have played an important part in the economic development of the country, and although the expenditure on river and canal improvements in Russia between 1860 and 1910 amounted to only about $40,000,000, as compared with more than $3,000,000,000 expended on railways, the growth of the water-borne traffic has been nearly as great as that of the railway traffic. About one-third of the Empire's total freight is transported by water, and this proportion has shown little variation during the last 30 years. The chief articles of freight shipped by the water routes are timber (which makes up 52 per cent of the water-borne freight), grain, naphtha and its products, salt, and coal.

The European part of the Empire is well provided with rivers of considerable size, affording shipping routes from the interior of the country to the Caspian, Black, Baltic, White, and North Seas, while in Siberia several great rivers rise near the southern boundary and empty into the Arctic Ocean, and the Amur system spreads itself across the southeastern part and flows into the Sea of Okhotsk at Nikolaiefsk.

The total length of the rivers, lakes, and canals of the Russian Empire is 239,161 miles, of which about 178,580 miles are navigable; 66 per cent of the total navigable length is suitable only for rafts and about 32 per cent for steamers. In northern Russia navigation is open from May to October; in central Russia, from April to November; in southern Russia, from March to November. In Siberia, the rivers are navigable in their southern courses from May to October, in their middle courses from May to September, and in all northern parts from June to August.

The Volga River System

The basin of the Volga River contains the greatest network of waterways in the Empire, the 19,060 miles of navigable streams in that system being nearly 40 per cent of the country's total. The lack of an outlet from the Caspian Sea, into which the Volga empties, however, necessitates the transferral of a large part of the freight sent down this river to the railway at Tsaritsin, and then to vessels on the River Don, which empties into the Sea of Azof, an arm of the Black Sea. The two rivers are less than 50 miles apart at Tsaritsin and projects to connect them by a canal date back to at least the sixteenth century. The work has never been actually undertaken, however.

In the spring of 1912 a company applied for a concession to connect the two rivers, its project calling for the construction of a canal at a cost of $43,000,000 and the dredging of the Don to make it navigable for ships of the Volga type, at a cost of about $10,000,000. The completion of such a canal would permit the bulk of the grain from the Volga basin to go out by way of the Black Sea, with an all-water route instead of being shipped by way of the Baltic, as at present. Timber could be transported from the Kama

district, sugar from the southwest, and naphtha from the Caspian and Volga regions. Cotton from Transcaucasia and great supplies of grain and other products from Siberia could be shipped by way of the canal.

Other Great Rivers

The Don River system has 2,508 miles of navigable waterway, while the Dnieper, Dniester, and Southern Bug Rivers, which enter the Black Sea at Kherson, Odessa, and Nicolaief, respectively, have with their branches navigable lengths of 6,300 miles, 534 miles, and 90 miles, respectively. The Vistula River system flows through Poland and then through northern Germany to the Baltic, with a navigable length of 2,016 miles.

In Siberia the Ob River system stretches from south of the Chinese boundary to the Gulf of Ob, on the Arctic Ocean, with a total navigable length of 16,869 miles. To the east of the Ob the Yenisei River system also crosses the country from south to north, being navigable for 11,808 miles, including Lake Baikal. The Lena River also gives a large part of Siberia water connection with the Arctic Ocean, being navigable for 6,864 miles, while smaller rivers pouring into the same ocean have a combined length of navigable channels of 5,443 miles.

The Amur River, which serves for a large part of its course as the boundary between Siberia and Manchuria, is the only large system flowing through Siberia to the east. It is navigable for 8,541 miles and taps the section crossed by the eastern part of the Trans-Siberian Railway.

Russia's Canal System

The canal system of Russia was largely constructed during the first half of the nineteenth century, and has been developed in eight connecting links. By these canals and canalized rivers the Caspian, Baltic, and White Seas and the Baltic and Black Seas are connected. The Volga is joined to the Neva by three canals, giving through water connection from St. Petersburg to the Caspian Sea, and with the northern Dvina by the Duke Alexander of Wurttemberg Canal, which unites the White and Caspian Seas. The Dnieper is connected by canals with the western Dvina, the Niemen, and the Vistula (via the Bug) Rivers, emptying into the Baltic, which connect that sea by water with the Black Sea. Finally, the Vistula is linked with the Niemen River by the Augusta Canal, 61 miles in length. The Ob-Yenisei waterway in Siberia runs from Irbit, on the Nitsa River, close to the frontier of European Russia, to Kiakhta, on the Selungua River, on the Chinese frontier, a distance of nearly 3,650 miles. The total length of artificial waterways is 1,225 miles. Of these artificial waterways 505 miles represent canals and 556 miles natural watercourses made navigable by sluices, etc.

It may be safely assumed that the river fleet numbers more than 4,000 steamers and not less than 23,500 barges, etc.

In regard to Asiatic Russia, the river fleet on the Ob, Yenisei, Lena, and Amur consisted in 1906 of 414 steamers and 825 other boats, with a total

capacity of 419,354 tons. Navigation is greater on the Ob (136 steamers and other vessels) and Amur (116 steamers and 247 other craft).

Railway Systems

The growth of Russia's railway system dates practically from the decade 1867-1877, at the close of which the mileage in the Empire amounted to 13,023. On the first of January, 1912, the total opened to permanent traffic was 46,221 miles, of which 28,744 belonged to the Russian Government lines, 14,079 to private lines, in Russia, 2,140 to the Finnish Government lines, 179 to private lines in Finland, and 1,079 to the Chinese Eastern Railway. In actual mileage, Russia ranks next to the United States, but its mileage in proportion to its population and area is small. The needs of the more densely settled southern and western parts of European Russia have been so great that only a few trunk lines have been extended into the newer sections, to aid in their exploitation, and these lines have so few branches or "feeders" that a large part of the Empire is left without railway facilities. Most of the important lines are in the hands of the Government, which has a definite program for the extension of existing lines and the construction of new ones to satisfy the demands of the many regions now in great need of railways, and to prevent the useless construction of lines in regions where they are not required.

Fairs

Fairs occupy a prominent position in the distributive mechanism of Russia, although they are gradually losing their importance with the extension of modern means of communication, which brings producer and consumer directly into touch with one another. Formerly the annual or seasonal fairs held at the most readily accessible places under the old form of transportation afforded the only markets where the people could dispose of their products, either by barter or sale, and obtain such articles as they needed and could not themselves produce. Commerce was in the hands of general traders, and most of the fairs served only a limited region. Some of the great fairs, however, drew traders from all parts of the country and became famous as the commercial centers of the country.

The Central Statistical Committee gives the number of fairs held in Russia at present as 16,000, with an annual turnover of more than $500,000,000. Most of these fairs (87 per cent) are agricultural, and only some 10 per cent have a turnover, retail and wholesale, of $5,000 to $50,000 per annum. The great fairs, with annual turnovers of $50,000 to $500,000, form only 1 per cent of the total number, and only two of these fairs have retained their national importance. These are the annual fairs at Nizhni Novgorod and Irbit.

The Great Fair at Nizhni Novgorod

Nizhni Novgorod owes its prominence to its position on the Volga River, which, with its tributaries, affords water communication with practically all

the great producing centers of European Russia and also served in former times as part of the principal trade route to Asia. Its trade is principally in the bulky products, such as furs, cotton goods, raw hides, tanned skins, leather goods, sheepskins, glass, and glassware. Most of the large cotton manufacturers of Lodz, Poland, maintain their own stores at Nizhni Novgorod. In the international market this fair is still important, sending out large quantities of furs, and rawhides (chiefly to the United States), wool, old rubber, cloth, etc.

There is also considerable sale of manufactured goods at the Nizhni Novgorod fair. Plated goods, enameled ironware, bent-wood furniture, and boots and shoes are largely sold by Polish manufacturers, although the European Russian makers of boots and shoes are now offering strong competition in that line. Buyers come from Persia, Khiva, Afghanistan, and the Caucasus to purchase manufactures of various sorts.

The Nizhni Novgorod fair opens in July and closes about the middle of September each year. Its character is largely dependent on the harvest, and in 1912 the trading was considered as very good. There is no noticeable decline in the actual amount of business done, but the fair is gradually losing its importance, and its effect on trade is diminishing. With the growing tendency to deal by means of samples, instead of presenting the entire stock to the customer's attention, and with the increasing facility with which manufacturers are able to reach their markets direct, the need for the fair is disappearing.

The Fur Fair At Irbit

Irbit is near the rich northern and central Ural regions, in the heart of the fur district, and is still an important exchange center in trade between European and Asiatic Russia. About 58 per cent of its business is with European Russia and the Caucasus, 40 per cent with Siberia, and only about 2 per cent with foreign countries. Its annual turnover amounts now to some $15,000,000, while formerly it ran as high as $36,000,000. Its trade in iron, cotton, wool, tea, sugar, and similar products has practically disappeared, and the trade in manufactured goods is also on the wane, as Russian firms are opening permanent stores in Siberia. In the fur, skin, and hide trade, Irbit still occupies a leading position, and its trade in glass, glassware, ropes, cordage, and similar bulky products is still large. All the chief Russian fur companies are directly represented at the Irbit fair, as are many foreign concerns, and furs from this fair make up from 30 to 50 per cent of the fur sales on the great markets of Leipzig and London. Left-over stocks of furs from the Irbit fair are sent to Nizhni Novgorod. Considerable business is also done in metal, wood, woolen, and homemade leather goods. The Irbit fair lasts through the month of February.

Minor Fairs

The annual fair held at Kief in February and March was formerly important, not for the sale of goods (its annual turnover is only some $2,500,-

000), but for the contracts that were made there. This fair bore some resemblance to foreign produce exchanges, and its business was principally done in sugar, spirits, wheat, seeds, agricultural produce, etc., and in the purchase, sale, and leasing of land. Bankers, manufacturers, agriculturalists, and others met at Kief during the fair to settle their outstanding accounts, and make contracts for future fulfillment. It was also customary for the stockholders of most of the sugar factories within a wide radius to assemble at Kief for their annual meetings. This fair has now lost most of its importance, however.

The enormous timber trade of Russia is still largely conducted through special fairs, of which the most important are those held at Kozmodemiansk, Kazan Government, from June to August, and at Tomel, Mohilev Government, in January. The average turnover of each of these fairs is $1,500,000 to $1,800,000.

Some 5,000 horse fairs are held throughout Russia each year, the largest being at Simbirsk, with a turnover of about $75,000, and cattle fairs are held in the steppe Provinces of Voronezh, Kharkof, and the Don. From 3,000 to 15,000 head of cattle are annually sold to salters at these fairs.

Forests

Russia now occupies first place among the nations of the world in the extent of its timber resources, the value and quality of two-thirds of which are practically unknown. The total area of the Empire is about one-seventh of the land surface of the globe, and 39 per cent of it is under forests. Those in European Russia cover an area of 474,000,000 acres; in Finland, 50,500,000 acres; in Poland, 6,700,000 acres; and in the Caucasus, 18,600,000 acres; a total of 549,800,000 acres, exclusive of Siberia. In the Ural Provinces, forests cover 70 per cent of the area, in the northern Provinces 68 per cent, and in the four lake Provinces 57 per cent. It is estimated that in western Siberia alone, there are 465,000,000 acres of virgin forest, and eastern Siberia, while not so richly endowed, has sufficient timber to supply the world's demand for years to come.

The Government owns 285,598,941 acres of forest land in European Russia, 12,826,387 acres in the Caucasus, 360,519,435 acres in Asiatic Russia, and 288,742,000 acres in the Amur region, a total of 947,686,763 acres. Twenty-three per cent of the forest land belonged to landed proprietors and 9 per cent to the peasantry in 1910.

The principal timber lands of eastern Siberia are in the valleys of the Amur River system, which cover an area of about 2,000,000 square miles. Of this area, only about 400,000 miles is considered available for timbering, but according to local calculations, allowing 45 merchantable trees to the acre, this would give some 11,520,000,000 trees. As the time required for these trees to mature is placed at 100 years, 115,200,000 trees could be cut per annum without diminishing the forests, with proper reforestration methods.

The timber areas of Siberia are now being rapidly exploited together with

the fisheries, particularly by foreign capitalists. The Forestry Department places the total timber land in Siberia at 810,000,000 acres, of which two-thirds can be successfully placed on the market.

JOINT MEETING OF THE AMERICAN GEOGRAPHICAL SOCIETY AND THE ASSOCIATION OF AMERICAN GEOGRAPHERS

THE second joint meeting of the Association of American Geographers and the American Geographical Society was held in New York City on April 9th and 10th. It was attended by nearly half the members of the Association of American Geographers and by members of the American Geographical Society and teachers of geography in New York City. Nine papers were given, dealing with various phases of physiography and human geography. The fields discussed included the islands in the South Seas, Argentina, southwestern United States, Labrador, Alaska, and Europe. The topics included coral reefs, oases, desert basins, glaciers, and glaciated mountains. Man's activities as influenced by geographical factors were discussed in connection with agricultural industries, with war and the weather, with race geography, and with the relations of geography and history. The papers by W. M. Davis on The Coast of New Caledonia, by M. L. Fernald on The Natural History of Ancient Vinland and Its Geographic Significance, and by Bailey Willis on Argentina and the Argentines were of especial interest. An evening session at the residence of Mr. George A. Plimpton was devoted to an exhibit of early American text books of geography. Among these were many rare books of very early date; there were text books made up entirely of questions and answers, text books written in verse, a geography written by Harriet Beecher Stowe, and several geographies published in the Confederate states during the Civil War. Owing to the fact that the number of papers read at the meeting was small there was an unusual opportunity for discussion. The map exhibit by the American Geographical Society included sets of large scale topographic sheets issued by the general staffs of the larger European countries and illustrating every section of the world in which fighting has taken place during the present war. There were also maps showing the topography and geology of the Grand Canyon of the Colorado, and sheets from the new agricultural atlas of the United States now in preparation by the Bureau of Plant Industry of the United States Department of Agriculture. L. M.

FOREIGN COMMERCE OF THE LEADING PORTS

(*Combined exports and imports mostly for* 1912. *U. S. figures are for* 1913.)

	Dollars
United Kingdom:	
London	1,866,900,000
Liverpool	1,816,900,000
Hull	391,000,000
Manchester	276,000,000
Southampton	253,500,000
Glasgow	247,100,000
Grimsby	174,600,000
Harwich	168,700,000
Leith	119,900,000
Bristol	105,100,000
Tyne Ports	101,000,000
Cardiff	97,800,000
Belfast	53,000,000
Germany:	
Hamburg	1,960,700,000
Bremen	632,400,000
Belgium: Antwerp	1,214,700,000
France: Marseille	731,400,000
Havre	619,200,000
Dunkirk	207,300,000
Bordeaux	179,500,000
Italy: Genoa	295,300,000
Naples	99,700,000
Turkey: Constantinople	68,600,000
Austria-Hungary: Trieste	307,500,000
Fiume	97,700,000
Russia: St. Petersburg	136,600,000
Riga	160,500,000
Odessa	70,600,000
Vindau	61,300,000
Reval	44,900,000
Libau	52,400,000
Novorossisk	42,100,000
Nikolaiev	32,300,000
Rostov	31,200,000
Kherson	14,200,000
Batum	24,500,000
Vladivostok	21,000,000
Spain: Barcelona	91,000,000
Valencia	28,100,000
Bilbao	28,500,000

United States: New York	1,966,200,000
Galveston	289,200,000
New Orleans	252,300,000
Boston	216,100,000
Philadelphia	169,500,000
Baltimore	149,300,000
San Francisco	128,500,000
Puget Sound	114,000,000
Savannah	62,600,000
Canada: Montreal	240,900,000
Mexico: Vera Cruz	82,800,000
Tampico	63,200,000
Cuba: Habana	123,800,000
Argentina: Buenos Aires	479,500,000
Brazil: Santos	251,900,000
Rio de Janeiro	171,500,000
Chile: Valparaiso	66,800,000
Iquique	36,600,000
Antofagasta	32,700,000
Uruguay: Montevideo	75,000,000

ASIA

China: Shanghai	185,600,000
Japan: Yokohama	235,200,000
Kobe	224,800,000
British Colonies: Singapore	269,500,000
Calcutta	447,200,000
Bombay	364,700,000

AFRICA

Egypt: Alexandria	276,500,000

OCEANIA

Australia: Sydney	304,200,000
Melbourne	210,100,000

[*Statistical Abstract of the United States.*]

The March *National Geographic Magazine* is almost wholly devoted to a superbly illustrated article on "Washington: Its Beginning, Its Growth and Its Future," by Ex-President Taft. There are 32 pages and two Panoramas in colors, and scores of half tones.

There is also a delightful paper on "Impressions of Palestine" by the Honorable James Bryce.

The National Geographic Society is the largest and richest Geographical society in the world, with nearly 400,000 members and assets of $370,000.

RECENT PUBLICATIONS

NORTHERN PATAGONIA, Character and Resources. By Bailey Willis. Copyrighted (1914) by the Author for the Ministry of Public Works of Argentina. Published by Chas. Scribners Sons, N. Y. Text volume (464 pp.) $6.00 net. Map volume, $2.00.

This volume has grown out of the studies and surveys made by Mr. Willis's party for the Argentine government. The text volume includes upwards of a dozen maps and the map volume contains 13 folded maps, mainly topographic. The text is illustrated with 37 plates, about half of which are beautifully executed photogravures.

The book contains a great deal of good geography and it is to be regretted that the price places it out of reach of most teachers.

Speaking of agricultural conditions the author says: "Were the farmers of the United States transplanted to Argentina they would find congenial climates and products to accord with their experiences at home in different sections of the country." The river provinces along the Parana and Paraguay and the provinces to the west and southwest are declared to be the heart of the nation, the region which will always be the seat of Argentine wealth and commerce. Irrigation to a limited degree along the Andean foothills is possible and will be profitable. Vast areas are suited only to grazing, yet much of the land now devoted to grazing will become agricultural land. Without coal, the country has little prospect of developing manufactures: "Agriculture, grazing and commerce are the activities clearly indicated as those which the Argentine nation must develop on the basis of the physical resources of the country." The forests are limited, and the valuable quebracho wood is being rapidly cut to make tanning extract. "The mate or Paraguayan tea takes a more important place in Argentine life than does coffee in North America." The conservation and proper utilization of the water resources form one of the greatest of the economic problems. The introductory chapter deals with Argentina as a whole but the remaining chapters hold rather closely to detailed descriptions of various parts of Northern Patagonia.

COLLEGE PHYSIOGRAPHY, by Ralph Stockman Tarr. 8vo. 837 pp. The Macmillan Company, 1914. $3.50.

This admirable volume is one of the latest fruits of Professor Tarr's tireless labors in the field of geography. His manuscript has been edited by Professor Martin, who has added the book and map lists, has written the seven chapters dealing with the earth's magnetism and the atmosphere, and has illustrated the entire work. It need hardly be added that to the junior author the task was a labor of love, in thus completing a worthy monument to the memory of a distinguished student of earth science. The volume is worthy to fill a large place in college instruction and is an indispensable source of help to every teacher of geography in the secondary schools.

Introductory chapters deal with the relations of the earth sciences, the history of physical geography, and fundamental facts in the fields of astronomy,

mineralogy and petrology. The physiography of the lands occupies nearly three fourths of the work. The type and heading, while offering a good and readable page, allow of exceptionally full discussion of all major topics. To rivers are given about one hundred pages, while to glaciers and glaciation a similar allotment is made. The chapters on the latter subjects reveal the exceptional experience and fullness of observation of both authors in this field. The Glacial Period occupies about fifty pages, which to the present reviewer, is amply justified, even though it be historical geology, by the need of interpreting the soils, waters and land forms of the glaciated areas, in the light of their origins and of their anthropogeographic importance. The attention to the human aspects of geography throughout the volume is significant.

The treatment of forces and reliefs is followed by a chapter on the earth's interior. This no doubt is geology, but the outline of theories regarding the interior of the globe is not more extended than will be found useful and appropriate in an advanced treatment of physical geography. The ocean and the atmosphere form the closing subjects, seventy two pages being devoted to the former and one hundred six pages to the latter theme. There is an adequate index and each chapter closes with a well selected and sufficiently full bibliography and a list of appropriate topographic maps. The illustration is in great richness and variety, numbering about five hundred maps, diagrams and half tones and several insets of parts of topographic sheets reproduced in color.

Albert Perry Brigham.

A Geographical Excursion in the Western United States

As a part of the summer work in Geography, under the auspices of Columbia University, Professor D. W. Johnson will conduct a geographical excursion in the Western United States next summer. The party will leave New York about the first of July, and will remain in the field two months. Among the places to be visited are the Devil's Tower, Yellowstone Park, Glacier National Park, the Grand Coulee, Crater Lake, San Francisco, San Andreas earthquake rift, the uplifted marine terraces at Santa Cruz, the Yosemite region, the Lassen Peak volcano and associated volcanic features; Lake Bonneville terraces, and the recent fault scarps southeast of Provo, Utah; the Hagermann Pass, the Royal Gorge of the Arkansas River, Pike's Peak and the Garden of the Gods. While in San Francisco the Exposition will be visited.

Two courses will be given: one on general physical geography and a more advanced course on the physiography of the Western United States. Attention will be directed to the economic phases of geography as illustrated by the regions visited. The courses are open to all students or teachers of geography whose application for membership may be approved by the Director. Full information regarding expenses, academic credit, and detailed plans for the trip may be obtained by addressing Professor D. W. Johnson, at Columbia University, New York City.